

LESSON 8

TOPIC 2

Deep Foundation – Pile Groups

DEEP FOUNDATION DESIGN

Lesson 8 - Topic 2 Pile Groups

Slide 8-2-1

DEEP FOUNDATION DESIGN Pile Groups

1. Recognize the Effects of Pile Spacing, Settlement and Negative Skin Friction

ACTIVITY: Question-Answer

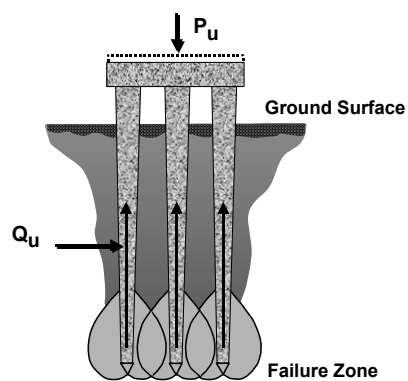
Slide 8-2-2

Pile Group Failure Modes

- ***Individual Pile Failure***
- ***Block Failure***

Slide 8-2-3

Individual Pile Failures

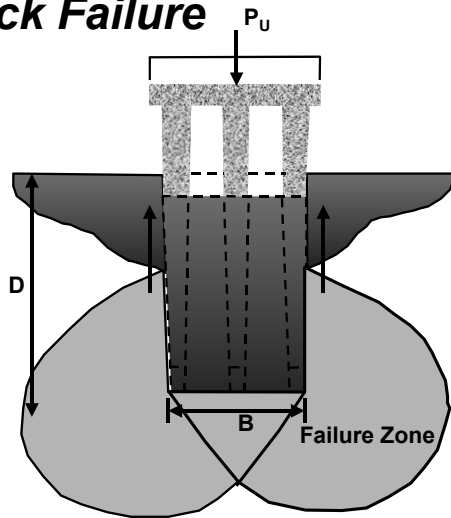


$$P_u = n Q_u E$$

n = Number of Piles
 E = Group Efficiency

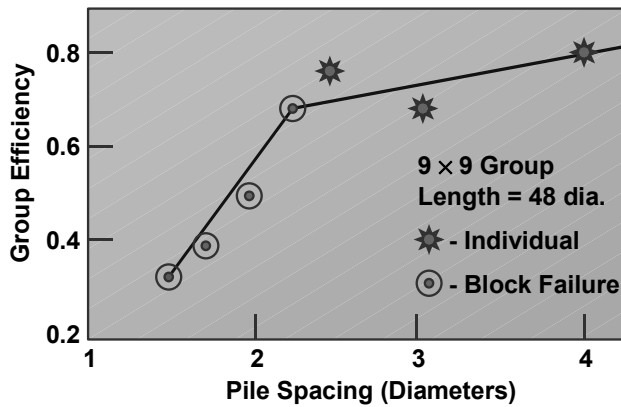
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Block Failure



Slide 8-2-5

Group Efficiency Vs. Pile Spacing in Clay



Slide 8-2-6

Pile Group Capacity in Sand

- ***For general sand case use $E = 100\%$***

$$P_{ult} = n Q_{ult}$$

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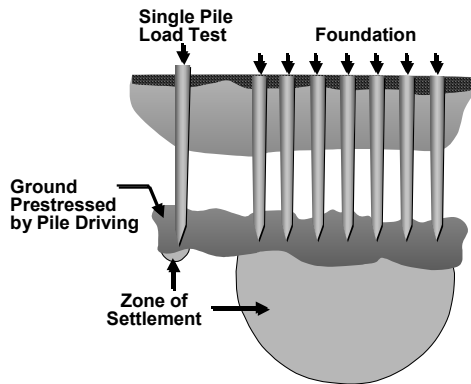
Pile Group Capacity in Clay

- ***For center to center pile spacing of $3D$***
 - $E = 70\%$
- ***For center to center pile spacing of $6D$***
 - $E = 100\%$

$$P_{ult} = n E Q_{ult}$$

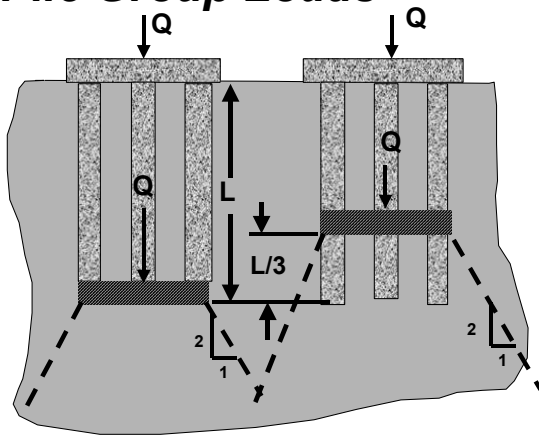
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Settlement of Pile Groups in Sand (After Skempton)



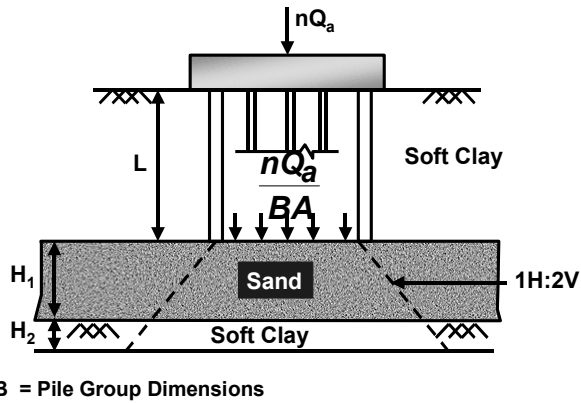
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General Concept of Distribution of Pile Group Loads



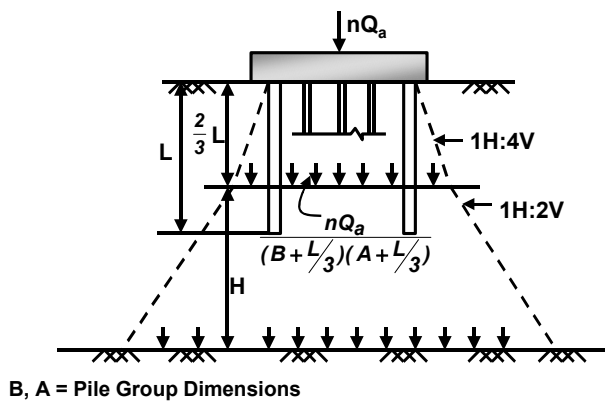
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Example Pressure Distribution for End Bearing Pile Groups



Slide 8-2-11

Example Pressure Distribution for Friction Pile Groups



Slide 8-2-12

Settlement Magnitude

$$\Delta H = H \frac{C_c}{1 + e_o} \text{Log} \frac{P_o + \Delta P}{P_o}$$

Where: ΔH = Settlement

H = Layer thickness

C_c = Compression Index

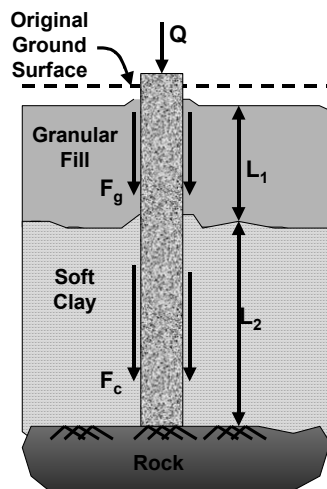
e_o = Initial voids ratio

P_o = Overburden Pressure

ΔP = Change in Pressure

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Negative Skin Friction



Slide 8-2-14

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SOILS AND FOUNDATIONS WORKSHOP

Assume Soil Profile Values Below

East Abutment

Pier

Fill $\gamma = 130$
 $\phi = 40$

Sand $\gamma = 110$
 $\phi = 36^\circ$

Clay $\gamma = 125$
 $c = 1100$
(Assume Sensitivity = 2)

Gravel $\gamma = 130$
 $\phi = 43^\circ$

15' 10' 11' 23' 7' 35' 10'

Consider Pile Group Problems at This Site.

Slide 8-2-17

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SOILS AND FOUNDATIONS
WORKSHOP

Deep Foundation Design - Pile Groups

- ***Recognize the effect of pile spacing, settlement, and negative skin friction***

Activities: Question - Answer

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